ELSEVIER

Spectrochimica Acta Part B 50 (1995) 1165–1178

SPECTROCHIMICA ACTA PART B

Review

Spectroscopic diagnostics of a strongly inhomogeneous optically thick plasma. Part 2. Determination of atom concentration and variations of different physical values in the plasma cross-section using asymmetric self-reversed emission and absorption lines

I.S. Fishman, G.G. Il'in, M.Kh. Salakhov*

Department of Physics, Kazan State University, Kazan, Tatarstan 420008, Russia

Received 5 September 1994; accepted 21 November 1994

Abstract

The possibility of determining electron impact half-width and electron concentration, atom concentration and radial distributions of different physical values using the profiles of asymmetric self-reversed emission and absorption lines simultaneously and sequentially recorded over the plasma cross-section is examined.

Keywords: Plasma; Self-reversed line

1. Introduction

This paper continues the work of Part 1 [1]. The aim of both contributions is to illustrate the possible ways of obtaining spectroscopic diagnostics on a strongly inhomogeneous optically thick plasma (SIOTP) using asymmetric self-reversed emission and absorption lines suffering Stark broadening by charged particles. Such a situation is characteristic of the dense plasmas of impulsing discharges, exploding wires, sparks, plasma jets, laser-induced plasmas (e.g. during metal welding and cutting), etc. As noted in Ref. [1], broadly speaking, spectroscopic diagnostics includes the determination of such important characteristics in the plasma cross-section under study as the temperature in the plasma centre T_0 and its distribution along the radius $T(r)$ (the problem of determining temperature using self-reversed spectral lines has been considered by us in detail in Ref. [2] so this problem is not considered in this paper; see also Section 3.3), the electron concentrations, $n_{e0}(0)$, and $n_e(r)$, respectively, absorbing atom

* Corresponding author.

SSDI 0584-8547(95)01263-X